failure. At Ochiltree crops and feed for stock were nearly destroyed. *Tennessee.*—At Ashwood corn was injured. At Chattanooga crops were a failure; the drought was broken on the 21st. *Illinois.*—At Louisville crops suffered during the first half of the month. *Indiana.*—At Seymour crops were injured; pastures were badly withered; and stock suffered from heat and scarcity of feed. *Kentucky.*—The drought which prevailed until the 23d caused great injury to crops, and was especially severe in Jefferson county. *Ohio.*—At Kenton corn was almost a total failure, and in some parts of the county it appeared about ½ crop; potatoes were also injured. At Napoleon corn, oats, and grass were suffering. At Cincinnati serious injury was caused to vegetation. At Wauseon the yield of potatoes was estimated at ⅓ the usual crop, and corn was badly damaged. *Michigan.*—At Birmingham all crops were damaged. At Hudson the month was reported the driest July in 12 years; potatoes appeared about ⅓ crop, and wheat was very light. At Thornville great injury was caused to corn and potatoes. *New York.*—At New Lisbon corn and pastures were suffering. *Massachusetts.*—At Amherst crops suffered from drought until the 25th. At Royalston vegetation was injured. *Maryland.*—The drought was severely felt throughout the state; it was broken on the 23d. At Cumberland the month was dry and hot; garden vegetation suffered greatly, and springs and streams were very low. At Barren Creek Springs the drought was broken by rain on the 25th; corn was badly injured, and vegetation was injured or destroyed by drought. *Virginia.*—At Staunton corn and vegetation in general suffered. At Yancey's Mills vegetation suffered; the drought was broken on the 24th. *North Carolina.*—At Asheville corn and oats were injured. *South Carolina.*—The section from Fair Forest through Spartanburgh to Cedar Springs and Walnut Grove suffered from drought until the 24th. *Alabama.*—Drought during the first part of the month damaged corn and injured cotton to some extent.

PRAIRIE FIRES.

A large quantity of grain, barns, and other property were destroyed near Macksville, Kans.

SUN SPOTS.

Mr. C. E. Buzzell, Leaf River, Ill.: 4th, large group in view on east limb; also a small group 2 days past meridian. The small group faded out 5th, while the larger one completed the transit; it was greatly reduced 10th. 22d, large group came in view by rotation and completed the transit, undergoing many changes on the 27th. 28th, large spot by rotation, followed by prominent faculæ; unchanged and in view on 31st. 29th, one small spot in south latitude two days in on east limb, it faded out 30th.

Mr. John W. James, Riley, Ill.: none seen until 5th, then 8 or 10 spots surrounded by very prominent faculæ on eastern edge. 7th, 2 or 3 spots west of this group, which on the 8th had mingled into one. The group of 5th had vanished on the 11th. 14th, the single spot disappeared from west edge and reappeared, increased in size, on eastern edge, 28th. 15th, 16th, 17th, immense areas of faculæ on west limb. 18th to 24th, no observations. 25th, a group of 1 large and 5 to 7 small spots half way east of meridian. 27th, large spot breaking up; was very faint 31st.

Mr. M. A. Veeder, Lyons, N. Y.: spot groups appeared on 4th, 5th, 22d, 23d, and 28th. All these groups were of considerable size, and underwent many changes, persisting, more or less, throughout their transit. Faculæ were seen at the eastern limb 13th, 14th, 15th, and 27th, and at the western limb 16th and 19th.

H. D. Gowey, North Lewisburgh, Ohio: sun spots were observed 7th to 12th, and 25th to 31st.

Haverford College Observatory, Pa. (observed by Prof. F. P. Leavenworth):

Date.	Number of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		Faculæ.	Remarks.
	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	Spots.	Groups.	
July, 1890.										
1, 10 a. m...	0	0	0	0	0	0	0	0	0	Definition fair.
4, 10 a. m...	2	11	0	0	0	0	2	11	1	Definition good; 2 large spots.
5, 5 p. m...	0	11	0	0	0	0	1	22	3	Definition good; 4 large spots.
6, 5 p. m...	0	3	0	0	0	0	1	25	3	Definition fair; several large spots
7, 12 m	0	8	0	0	0	0	1	33	2	Definition fine; 2 large spots.
8, 11 a. m...	1	2	0	0	0	0	3	32	....	Definition good; 3 large spots.
9, 11 a. m...	0	15	0	0	0	0	2	48	0	Definition fair.
10, 11 a. m...	0	0	0	0	0	0	2	28	0	Definition fair.
11, 3 p. m...	0	0	0	0	0	0	2	10	1	Definition fair.
12, 11 a. m...	0	0	0	0	0	0	2	5	0	Definition poor.
14, 12 m	0	0	0	0	0	0	1	4	2	Definition fair.
15, 11 a. m...	1	2	1	4	0	0	1	2	2	Definition good.
16, 10 a. m...	0	0	0	0	0	0	0	0	1	Definition poor.
17, 11 a. m...	1	1	0	0	0	0	1	1	0	Definition fair; spots small.
18, 5 p. m...	0	0	0	0	0	0	0	0	1	Definition good.
19, 5 p. m...	0	0	0	0	0	0	0	0	1	Definition good.
20, 5 p. m...	0	0	0	0	0	0	0	0	0	Definition good.
21, 10 a. m...	0	0	0	0	0	0	0	0	0	Definition poor.
22, 10 a. m...	1	3	0	0	1	3?	1	3	1	Definition bad.
23, 12 m	1	6	0	0	0	0	2	9	2	Definition fair; 1 large spot.
26, 5 p. m...	0	16	0	0	0	0	1	20	0	Definition good.
27, 5 p. m...	0	0	0	0	0	0	1	12	1	Definition good.
30, 11 a. m...	3	3	0	0	0	0	4	13	1	Definition good; 1 large spot.
31, 10 a. m...	0	0	0	0	0	0	4	9	2	Definition good; 1 large spot.

VERIFICATIONS.

FORECASTS FOR 24 HOURS IN ADVANCE.

[Verifications made by Assistant Professor C. F. Marvin, assisted by Mr. H. E. Williams, chief clerk of the Forecast Division.]

The forecasts for districts east of the Rocky Mountains for July, 1890, were made by Captain James Allen, 3d Cavalry, Signal Officer, and those for the Pacific coast districts were made at San Francisco, Cal., by 2d Lieutenant John P. Finley, Signal Corps.

Percentages of forecasts verified, July, 1890.

States.		States.	
Maine	80.4	Delaware	81.0
New Hampshire	81.2	Maryland	83.8
Vermont	79.6	District of Columbia	84.5
Massachusetts	78.1	Virginia	80.5
Rhode Island	78.5	North Carolina	83.8
Connecticut	75.8	South Carolina	83.7
Eastern New York	80.6	Georgia	82.5
Western New York	84.2	Eastern Florida	88.4
Eastern Pennsylvania	78.2	Western Florida	85.4
Western Pennsylvania	84.6	Alabama	86.6
New Jersey	81.4	Mississippi	84.2

Percentages of forecasts verified—Continued.

States.		States.	
Louisiana	87.5	Nebraska	84.1
Texas	93.5	Missouri	85.8
Arkansas	87.7	Colorado	79.0
Tennessee	83.5	North Dakota	87.4
Kentucky	87.7	South Dakota	82.6
Ohio	85.6	Southern California*	94.0
West Virginia	80.3	Northern California*	92.2
Indiana	87.4	Oregon*	84.7
Illinois	86.0	Washington*	85.8
Lower Michigan	82.1	*By elements:* Weather	86.4
Upper Michigan	77.9	Temperature†	78.2
Wisconsin	77.7		
Minnesota	78.8	Monthly percentage of weather and temperature combined‡	83.1
Iowa	84.6		
Kansas	82.9		

*In determining the monthly percentage of weather and temperature combined, the Pacific coast states are not included. †The forecasts of temperature in districts east of the Rocky Mountains for July, 1890, were made with reference to the maximum temperature alone; that is, a prediction of warmer or cooler indicated that the maximum temperature of the day designated would be higher or lower than the maximum of the previous day. ‡The monthly percentage of weather and temperature combined is determined by multiplying the percentage of weather by 6, and the percentage of temperature by 4, and dividing their sum by 10.

FORECASTS FOR 48 AND 72 HOURS IN ADVANCE.

Appreciating the great importance that long time predictions possess for the general public the Chief Signal Officer has authorized forecasts for 48 and 72 hours, covering the second and third days in advance. These are optional with the forecast official, and are only made when clearly in the public interest, and cover, in all cases, considerable areas of country, and are not confined to localities.

Percentages of verifications of forecasts made for second day in advance. Number of predictions made: weather, 72; temperature, 54. Percentages of verifications: weather, 87.4; temperature, 48.1; weather and temperature combined, 73.5. For third day in advance. Number of predictions made: weather, 13; temperature, 7. Percentages of verifications: weather, 87.6; temperature, 44.3; weather and temperature combined, 76.2.

CAUTIONARY SIGNALS FOR JULY, 1890.

Statement showing percentages of justifications of wind signals for the month of July, 1890:

Wind signals.—(Ordered by Captain James Allen.) Total number of signals ordered, 48; justified as to velocity, 34, as to direction, 43. All of the signals ordered were cautionary. 26 signals were ordered for easterly winds, of which 22 were justified, and 22 were ordered for westerly winds, of which 21 were justified. Percentage of justifications, 63.3.

No cold-wave signals were ordered during the month.

Percentages of verifications of weather and temperature signals reported by directors of the various State Weather Services for July, 1890.

States.	Weather.	Temperature.	States.	Weather.	Temperature.
Illinois	84.2	83.5	Nebraska	80.4	88.7
Louisiana, northern	77.0	80.0	New Jersey	89.3	81.3
Louisiana, southern	79.0	82.0	North and South Dakota	87.0	93.0
Michigan	90.2	89.7	Ohio	82.0	88.0
Minnesota	67.0	72.0	Pennsylvania	86.0	91.0
Missouri	85.0	88.0	South Carolina	74.8	89.8

STATE WEATHER SERVICES.

[*Temperature in degrees Fahrenheit; precipitation, including melted snow, in inches and hundredths.*]

The following extracts and summaries are republished from reports for July, 1890, of the directors of the various state weather services:

ALABAMA.

Temperature.—Highest monthly mean, 92, at Selma; lowest monthly mean, 80, at Chepultepec; maximum, 105, at Opelika, 1st and 3d; minimum, 60, at Fayette C. H., 5th; greatest local monthly range, 42, at Opelika; least local monthly range, 19, at Chepultepec.

Precipitation.—Greatest monthly, 9.98, at Eufaula; least monthly, 2.85, at Selma.

Wind.—Prevailing direction, southeast.—*Prof. P. H. Mell, Auburn, director; J. M. Quarles, Private, Signal Corps, assistant.*

ARKANSAS.

Temperature.—Highest monthly mean, 85.1, at Stuttgart; lowest monthly mean, 77.6, at Ozone; maximum, 106, at Lead Hill, 31st; minimum, 56, at Osceola, 6th; greatest local monthly range, 44, at Lead Hill; least local monthly range, 16, at Winslow.

Precipitation.—Greatest monthly, 8.43, at Ozone; least monthly, 0.00, at Camden and Texarkana.—*M. F. Locke, Commissioner of Agriculture, Little Rock, director; W. U. Simons, Sergeant, Signal Corps, assistant.*

COLORADO.

Temperature.—The mean was 4.0 above the average for the past 4 years; highest monthly mean, 82.6, at Lamar; lowest monthly mean, 52.6, at Climax; maximum, 108, at Lamar, 28th; minimum, 26, at Breckenridge, 1st, 2d, 4th, and 12th; greatest local monthly range, 61, at Breckenridge; least local monthly range, 26, at Moraine.

Precipitation.—About the average for July was recorded, but the distribution was uneven, and generally a lack of rainfall was noticeable, as the precipitation for June was light.

Wind.—Prevailing direction, west.—*Prof. F. H. Loud, Colorado Springs, director; W. S. Miller, Sergeant, Signal Corps, assistant.*

ILLINOIS.

Temperature.—The mean was 0.3 below the normal of the last 15 years; maximum, 106, at Atwood and McLeansborough, 8th, and at Rushville, 14th; minimum, 42, at Atwood and Hennepin, 5th; greatest local monthly range, 64, at McLeansborough; least local monthly range, 26, at Martinsville.

Precipitation—Greatest monthly, 6.98, at Charleston; least monthly, 0.30, at Mascoutah.

Wind.—Prevailing direction, southwest.—*John Craig, Sergeant, Signal Corps, Springfield, in charge.*

INDIANA.

Temperature.—Highest monthly mean, 78.5, at Seymour; lowest monthly mean, 69.3, at Point Isabel; maximum, 103, at Angola, 12th; minimum, 41, at Point Isabel, 5th; greatest local monthly range, 56, at Logansport; least local monthly range, 23, at Butlerville.

Precipitation.—Greatest monthly, 10.90, at Marengo; least monthly, 0.05, at Franklin.

Wind.—Prevailing direction, southwest.—*Prof. H. A. Huston, La Fayette, director; H. R. Patrick, Private, Signal Corps, assistant.*

IOWA WEATHER AND CROP SERVICE.

The month was characterized by periods of intense heat, with high winds and drought.

Temperature.—Highest monthly mean, 81.9, at Glenwood; lowest monthly mean, 70.8, at Cresco; maximum, 110, at Glenwood, 13th; minimum, 45, at Wesley, 4th; greatest local monthly range, 56, at Glenwood; least local monthly range, 33, at Independence.

Precipitation.—Greatest monthly, 5.00, at Eagle Grove; least monthly, 0.37, at Oskaloosa.

Wind.—Prevailing direction, southeast.—*J. R. Sage, Des Moines, director; G. M. Chappel, Sergeant, Signal Corps, assistant.*

KANSAS.

The month was characterized by unusually small precipitation and high temperature.

Temperature.—The mean ranged from 2.5 to 8 above the normal in the eastern division, to 6 in the middle, and to 5 in the western; highest monthly mean, 92.4, at Ellis; lowest monthly mean, 76.6, at Weskan; maximum, 118, at Gibson, 17th; minimum, 45, at Lakin, 27th; greatest local monthly range, 62, at Gibson, Lakin, and Weskan; least local monthly range, 35, at Grenola; greatest daily range, 57, at Lakin, 27th; least daily range, 10, at Wichita, 21st.

Precipitation.—The precipitation was deficient in every county; greatest monthly, 4.50, at Ogallah; least monthly, 0.00, at a few stations.

Wind.—Prevailing direction, south.—*Prof. J. T. Lovewell, Topeka, director; T. B. Jennings, Sergeant, Signal Corps, assistant.*

KENTUCKY.

Temperature.—The average was slightly below the normal; maximum, 101, at Murray, 16th; minimum, 44, at Murray, 6th; greatest local monthly range, 57, at Murray; least local monthly range, 29, at Frankfort.

Precipitation.—The average was 1.50 below the normal; greatest monthly, 5.92, at Harrodsburgh; least monthly, 0.75, at Pellville.

Wind.—Prevailing direction, southwest.—*Dr. E. A. Grant, Louisville, director; Frank Burke, Sergeant, Signal Corps, assistant.*

LOUISIANA.

Temperature.—The mean was 0.1 above the normal in the northern and 1.1 below in the southern section; highest monthly mean, 84.0, at Mandeville; lowest monthly mean, 77.9, at Lake Charles; maximum, 102, at Clinton, 7th, at Plaquemine, 17th, and at Cameron, 6th and 18th; minimum, 59, at Lake Charles, 2d; greatest local monthly range, 42, at Clinton; least local monthly range, 22, at Abbeville.

Precipitation.—The average was 1.00 below the normal for the northern and nearly 1.00 above for the southern section; greatest monthly, 11.58, at Jackson Barracks; least monthly, 0.98, at Marksville.

Wind.—Prevailing direction, south.—*R. E. Kerkam, Sergeant, Signal Corps, New Orleans, in charge.*

MICHIGAN.

The features of the month were the great deficiency in rainfall in the south section, the excess in the north section and upper peninsula, and the large number of clear days.

Temperature.—The mean was 1.5 below the normal of the last fifteen years; highest monthly mean, 73.9, at Benton Harbor; lowest monthly mean, 62.1, at Atlantic; maximum, 100, at Bangor, 30th; minimum, 35, at Roscommon, 5th; greatest local monthly range, 57, at Benton Harbor; least local monthly range, 34, at Pontiac; greatest daily range, 48, at Grayling, 27th; least daily range, 2, at Alpena, 6th.

Precipitation.—The average was 1.61 below the normal of the last fifteen years; greatest monthly, 8.49, at Sheboygan; least monthly, 0.04, at Oswego.

Wind.—Prevailing direction, southwest.—*N. B. Conger, Sergeant, Signal Corps, Lansing, director.*